United States Department of Agriculture
Agricultural Marketing Service, Science & Technology
Pesticide Data Program

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Title: Sample Preparation for Fresh Fruit and Vegetable, Grain, and Processed Commodities		
Revision: 11	Replaces: 01/01/02	Effective: 10/01/02

1. Purpose:

To provide standard procedures for the preparation of USDA/AMS Pesticide Data Program (PDP) fresh fruit and vegetable, grain, and processed commodities.

2. Scope:

This standard operating procedure (SOP) shall be followed by all laboratories conducting residue studies for PDP, including support laboratories conducting stability or other types of studies that may impact the program.

3. Outline of Procedures:

5.1 Preparation and Homogenization of Fresh Fruit and Vegetable Commodities

a. Apples
b. Asparagus
c. Bananas
d. Broccoli
e. Cabbage
f. Cantaloupes
g. Carrots
h. Celery
i. Corn
j. Cucumbers
k. Grapes
l. Green Beans
m. Head Lettuce
n. Honeydew Melons
o. Leaf Lettuce
p. Mushrooms
q. Onions
r. Oranges/Grapefruit

s. Peaches/Nectarines
t. Pears
u. Peas
v. Pineapples
w. Plums
x. Potatoes
y. Spinach
z. Strawberries
aa. Summer Squash
ab. Sweet Cherries
ac. Sweet Peppers
ad. Sweet Potatoes
ae. Tomatoes
af. Winter Squash

5.2 Preparation and Homogenization of Grains

5.3 Preparation and Homogenization of Processed Commodities

a. Canned Commodities
b. Frozen Commodities
c. Juices/Concentrates
d. Other Processed, Packaged Commodities

5.4 Storage of Subsamples

5.5 Weighing of Analytical Portion

4. References:

- USDA/AMS-EPA Planning Meeting, March 14, 2001
- USDA/AMS PDP Quality Assurance(QA)/Technical Meeting, February 21-22, 2001
- Federal/State Meeting, October 31-November 2, 2000

- FDA Standard Operating Procedure for the Total Diet Study KCX-1, Appendix E, Final Preparation Procedures, January 19, 1993
- FDA Standard Operating Procedure for the Total Diet Study KCX-1, Appendix F, Instructions for the Items Prepared by Contract Kitchen, January 19, 1993

5. Specific Procedures to be Followed:

This standard operating procedure (SOP) represents minimum PDP requirements and is presented as a general guideline. Each laboratory shall have written procedures that provide specific details concerning how the procedure has been implemented in that laboratory. These instructions shall include specific practices for minimizing cross-contamination during preparation of multiple samples (e.g., cleaning of equipment and utensils between samples). Both the USDA/AMS SOPs and the laboratory's internal SOPs will be used as the measure of compliance in the event of a USDA/AMS laboratory review.

5.1 Preparation and Homogenization of Fresh Fruit and Vegetable Commodities

Refer to SOP PDP-LABOP-01 for sample receipt and acceptability criteria.

For all commodities, the entire sample shall be homogenized. If the entire sample does not fit into the homogenizer/chopper at one time, then the sample may be homogenized in portions. All portions shall be mixed together in a clean container to assure an evenly mixed sample.

If the laboratory receives a sample that weighs significantly more than the targeted weight (e.g., 10 pounds when target weight is 5 pounds), then the laboratory may randomly select the targeted weight of product for homogenization, as long as units or bunches are not broken (e.g., halving melons or splitting grape bunches). Document on the Laboratory Information Form (LIF) that the sample was unusually large and contact the PDP Sampling Manager.

a. Apples

Wash each apple under cold running tap water for approximately 15-20 seconds to assure that all surfaces of the apple have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Do not peel. Remove the stem, if present. With a commercially available apple corer remove core or, using a clean, dry knife, cut each apple in half or quarters and remove the core portion. Mechanically chop just until a visually homogeneous mixture is attained.

b. Asparagus

Remove an inch or two of the woody stem, if inedible. Wash asparagus spears under cold running tap water for approximately 15-20 seconds to assure that the water has rinsed all portions of the sample. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained.

c. Bananas

If necessary, banana samples may be stored in a secure location at room temperature for up to 72 hours for ripening purposes. Peel each fruit. Mechanically chop just until a visually homogeneous mixture is attained.

d. Broccoli

Visually examine and discard any damaged portion or wilted florets. Additionally, it may be necessary to remove an inch or two of the woody stem, if inedible. Wash the sample under cold running tap water for approximately 15-20 seconds to assure that the water has rinsed all portions of the sample. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained.

e. Cabbage

Visually examine the head and remove wrapper and damaged or wilted leaves. Rinse the head under cold running tap water for approximately 15-20 seconds. Turn the head top side down. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained.

f. Cantaloupes

Using a clean, dry knife, cut each cantaloupe in half and remove seeds and rind. Halves may be further divided at this point to facilitate removal of the rind. Mechanically chop just until a visually homogeneous mixture is attained.

g. Carrots

Hold each carrot under cold running tap water and gently scrub the entire surface with a clean vegetable brush to remove any loose soil and grit. Rinse each scrubbed carrot under cold running tap water for approximately 15-20 seconds to assure that all surfaces of the carrot have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. With a clean, dry knife, remove stem cap portion from each carrot. Mechanically chop just until a visually homogeneous mixture is attained.

h. Celery

Using a clean, dry knife, remove the inedible portion of the stalk (i.e., the woody part at the base of the stalk) to allow the stems to separate. Do not remove the leaves unless discolored or damaged. Wash the stems under cold running water for approximately 15-20 seconds to assure that all surfaces have been rinsed and that all extraneous matter (e.g., soil) is removed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained.

i. Corn

Remove husk and silk from each ear. Wash each ear under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Using a clean dry knife or other appropriate utensil, remove kernels from cob. Mechanically chop just until a visually homogeneous mixture is attained.

j. Cucumbers

Wash each cucumber under cold running tap water for approximately 15-20 seconds to assure that all surfaces of the cucumber are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Cucumbers may be halved or quartered at this point to facilitate homogenization. Mechanically chop just until a visually homogeneous mixture is attained.

k. Grapes

Wash each sample under cold running tap water for approximately 15-20 seconds to assure that all surfaces have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Remove all stems and extraneous matter. Mechanically chop just until a visually homogeneous mixture is attained.

l. Green Beans

Wash fresh beans under cold running tap water for approximately 15-20 seconds to assure that all surfaces have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Do not peel. Using a clean, dry knife, remove any stems that are present. Mechanically chop just until a visually homogeneous mixture is attained.

m. Head Lettuce

Visually examine the head and remove wrapper and damaged or wilted leaves. Rinse the head under cold running tap water for approximately 15-20 seconds. Turn the head top side down. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained.

n. Honeydew Melons

Using a clean, dry knife, cut each melon in half and remove seeds and rind. Halves may be further divided at this point to facilitate removal of the rind. Mechanically chop just until a visually homogeneous mixture is attained.

o. Leaf Lettuce

Visually examine the sample and remove only the damaged or wilted leaves and any woody stems. Wash remaining sample under cold running tap water for approximately 15-20 seconds to assure that all surfaces have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained.

p. Mushrooms

Wash mushrooms under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Using a clean, dry knife, slightly trim end pieces to remove any inedible/woody portions. Mechanically chop just until a visually homogeneous mixture is attained.

q. Onions

Using a clean knife, remove onion top, outer layer, first white layer and membrane, and any other inedible portions. Remove root portion last to minimize fumes. Preparation procedures may be performed with onions

immersed in cold tap water, with total immersion time for each unit not to exceed 10 minutes. Allow onions to drain at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained.

r. Oranges and Grapefruit

Peel each fruit and remove any excess white membrane. Mechanically chop just until a visually homogeneous mixture is attained.

s. Peaches/Nectarines

Wash each peach under cold running tap water for approximately 15-20 seconds to assure that all surfaces of the peach are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Do not peel. Remove stem and leaves if present. Using a clean, dry knife, cut the peach around the pit (i.e., without cutting through the pit). Remove the pit, being careful to remove as little of the meat as possible. Mechanically chop just until a visually homogeneous mixture is attained.

t. Pears

Wash each pear under cold running tap water for approximately 15-20 seconds to assure that all surfaces of the pear have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Do not peel. Remove stem, if present. Using a clean, dry knife, cut each pear in half or quarters and remove the core portion. Mechanically chop just until a visually homogeneous mixture is attained.

u. Peas

For each sample, shell enough peas to comprise at least one cup. Discard pods. Rinse peas under cold running tap water for approximately 15-20 seconds to assure that all surfaces have been rinsed. Allow to drain for at

least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained.

v. Pineapples

Wash each pineapple under cold running tap water for approximately 15-20 seconds to assure that all surfaces of the fruit have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Remove the top of each pineapple. Using a clean, dry knife, cut in half and remove core and shell. Mechanically chop just until a visually homogeneous mixture is attained.

w. Plums

Wash each plum under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Do not peel. Remove stem and leaves if present. Using a clean, dry knife, cut the plum around the pit (i.e., without cutting through the pit). Remove the pit, being careful to remove as little of the meat as possible. Mechanically chop just until a visually homogeneous mixture is attained.

x. Potatoes

Hold each potato under cold running tap water and gently scrub the entire surface with a clean vegetable brush to remove any loose soil and grit. Rinse each scrubbed potato under cold running tap for approximately 15-20 seconds to assure that all surfaces of the potato have been rinsed and allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained.

y. Spinach

Visually examine the sample and remove only the damaged or wilted leaves and any woody stems. Wash remaining sample under cold running tap water

for approximately 15-20 seconds to assure that all surfaces have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained.

z. Strawberries

Wash strawberries by the handful or by using a colander under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Remove stems and leaves if present. Mechanically chop just until a visually homogeneous mixture is attained.

aa. Summer Squash

Wash each squash under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Using a clean, dry knife, remove end pieces. Mechanically chop just until a visually homogeneous mixture is attained.

ab. Sweet Cherries

Wash cherries under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Remove the pit, being careful to remove as little of the meat as possible. A commercial cherry pitter is recommended. Mechanically chop just until a visually homogeneous mixture is attained.

ac. Sweet Peppers

Wash each pepper under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Using a clean, dry knife, remove stem, core, and seeds. Mechanically chop just until a visually homogeneous mixture is attained.

ad. Sweet Potatoes

Hold each sweet potato under cold running tap water and gently scrub the entire surface with a clean vegetable brush to remove any loose soil and grit (remove any woody stems if present). Rinse each scrubbed sweet potato under cold running tap for approximately 15-20 seconds to assure that all surfaces have been rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Mechanically chop just until a visually homogeneous mixture is attained.

ae. Tomatoes

Wash each tomato under cold running tap water for approximately 15-20 seconds to assure that all surfaces of the tomato are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. Do not peel. Using a clean, dry knife, cut the tomato around the stem area. Remove any stem, being careful to remove as little of the meat as possible. The tomatoes may be quartered prior to homogenization. Mechanically chop just until a visually homogeneous mixture is attained.

af. Winter Squash

Wash each squash under cold running tap water for approximately 15-20 seconds to assure that all surfaces are rinsed. Allow to drain for at least 2 minutes on paper towels on a flat surface. When possible, using a clean, dry knife, remove stem and/or end pieces. Mechanically chop just until a visually homogeneous mixture is attained.

5.2 Preparation and Homogenization of Grains

The sample is defined as the portion that the collector sends to the laboratory, usually 1 kilogram. Pour entire grain sample into a Boerner Divider and use one of the two resulting 500 gram sub-samples for homogenization (the remaining 500 gram sub-sample can be stored). Grind the 500 gram subsample using an appropriate device

(e.g., Falling 3300 laboratory mill, Jacobsen grinder, UDY). Tumble the resulting powder homogenate to obtain a homogeneous mixture.

5.3 Preparation and Homogenization of Processed Commodities

The sample is defined as the portion that the collector sends to the laboratory, usually between one and seven pounds. For all commodities, the entire sample shall be homogenized. If the entire sample does not fit into the homogenizer/chopper at one time, then the sample may be homogenized in portions. All portions shall be mixed together in a clean container to assure an evenly mixed sample.

a. Canned Commodities

If the lid of the can has visible dirt or dust, rinse the lid under cold running tap water for 5 to 10 seconds. Dry the lid with a paper towel. Open each can and pour the entire contents of each can including the liquid into a blender/homogenizer. Blend just until a visually homogeneous mixture is attained.

b. Frozen Commodities

The samples may be chopped while frozen, or to prevent damage to the chopper/homogenizer blades, the sample may be thawed in a refrigerator or in a room temperature water bath. Open the containers and pour the entire contents into the chopper/homogenizer. Mechanically chop just until a visually homogeneous mixture is attained.

c. Juices/Concentrates

For fresh and reconstituted juices, assure that sample is evenly mixed in order to obtain a homogeneous mixture. For concentrates, dilute juice in a dry, clean container with cold running tap water, according to label directions. Mix well to ensure a homogeneous mixture.

Canned product concentrates (e.g., tomato paste) may be considered homogeneous and do not need to be mixed prior to weighing of analytical portion. Dilute appropriate analytical portion with sufficient water to facilitate sample extraction. Report results based on undiluted concentrated product.

d. Other Processed, Packaged Commodities

For other processed, packaged products (e.g., corn syrup and peanut butter) that may be considered homogeneous, simply weigh appropriate analytical portion. If a processed, packaged product appears non-homogeneous, assure that the sample is evenly mixed prior to weighing of analytical portion.

5.4 Storage of Subsamples

An adequate portion of homogenized sample shall be held in reserve if reanalysis and/or confirmation is needed. This portion shall be distributed among several small containers (polypropylene or styrofoam recommended) rather than one large container. One or more portions shall be pre-weighed according to the analytical methodology. The laboratory internal SOP shall define "adequate portion" and the distribution.

5.5 Weighing of Analytical Portion

An appropriate amount of homogenized sample shall be weighed for analysis. The laboratory internal SOP shall define the sample weight and the necessary precision, which:

a. For a 50 gram sample shall not be more than +/- 0.25 grams.

b. For a 100 gram sample shall not be more than +/- 0.5 grams.

c. For a 500 gram sample shall not be more than +/- 2.5 grams.

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- Revised strawberry preparation procedures in subsection 5.1.z